

## **Using NASA's Space Launch System to Enable Game Changing Science Mission Designs**

Stephen D. Creech, Strategic Development Manager  
Space Launch System Program  
NASA Marshall Space Flight Center, AL 35812

### **Abstract:**

NASA's Marshall Space Flight Center is directing efforts to build the Space Launch System (SLS), a heavy-lift rocket that will help restore U.S. leadership in space by carrying the Orion Multi-Purpose Crew Vehicle and other important payloads far beyond Earth orbit. Its evolvable architecture will allow NASA to begin with Moon fly-bys and then go on to transport humans or robots to distant places such as asteroids, Mars, and the outer solar system.

Designed to simplify spacecraft complexity, the SLS rocket will provide improved mass margins and radiation mitigation, and reduced mission durations. These capabilities offer attractive advantages for ambitious missions such as a Mars sample return, by reducing infrastructure requirements, cost, and schedule. For example, if an evolved expendable launch vehicle (EELV) were used for a proposed mission to investigate the Saturn system, a complicated trajectory would be required – with several gravity-assist planetary fly-bys – to achieve the necessary outbound velocity. The SLS rocket, using significantly higher C3 energies, can more quickly and effectively take the mission directly to its destination, reducing trip times and cost.

As this paper will report, the SLS rocket will launch payloads of unprecedented mass and volume, such as “monolithic” telescopes and in-space infrastructure. Thanks to its ability to co-manifest large payloads, it also can accomplish complex missions in fewer launches. Future analyses will include reviews of alternate mission concepts and detailed evaluations of SLS figures of merit, helping the new rocket revolutionize science mission planning and design for years to come.